Claims

What is claimed is:

1. A waveguide structure comprising:

a waveguide; comprising;

a curved waveguide portion that is curved having local radii of curvature, and

a first trench disposed on an inside of the curvature of the waveguide, said first trench having a low index of refraction material disposed therein, said first trench comprising;

a first portion of the first trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein,

a second trench portion of the first trench disposed sufficiently proximate said waveguide to substantially enhance confinement of an optical signal propagating within the curved waveguide portion, and

a third trench portion of the first trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein.

2. A waveguide structure according to claim 1, wherein the curved waveguide portion comprises:

a first waveguide portion, said first waveguide portion being straight;

a second waveguide portion that is curved having local radii of curvature and optically coupled between the first waveguide portion and the third waveguide portion; and,

a third waveguide portion, said third waveguide portion being straight, said third waveguide portion optically coupled to the second waveguide portion;

3. A waveguide structure according to claim 1, comprising:

a second trench disposed on a second other side of the waveguide, said second trench having a low index of refraction material disposed therein, the second trench comprising:

a first trench portion of the second trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein;

a second trench portion of the second trench disposed sufficiently proximate said waveguide to substantially enhance confinement of an optical signal propagating within the second waveguide portion; and,

a third trench portion of the second trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein.

4. A waveguide structure according to claim 3, comprising:

a second waveguide, the second waveguide disposed on said waveguide structure on a side of the second trench opposite the first waveguide.

5. A waveguide structure according to claim 4, wherein the second waveguide is disposed sufficiently proximate the second trench to substantially enhance confinement of an optical signal propagating within the second waveguide.

6. A waveguide structure according to claim 1, wherein the local radius of curvature of the curved waveguide portion when expressed as a function of a distance that light propagates within the first waveguide portion, the second waveguide portion and the third waveguide portion has an approximately continuous first order derivative.

7. A waveguide structure according to claim 1, wherein the local radius of curvature of the second waveguide portion when expressed as a function of a distance that light propagates within the second waveguide portion has a continuous second order derivative.

8. A waveguide structure according to claim 7, comprising a semiconductor waveguide substrate.

9. A waveguide structure according to claim 1, wherein the waveguide is a ridge waveguide.

10. A waveguide structure according to claim 1, wherein the waveguide is a buried waveguide.

11. A waveguide structure according to claim 1, wherein at least one trench portion perforates the surface of the structure.

12. A waveguide structure according to claim 1, wherein at least one trench portion does not perforate the surface of the structure.

13. A waveguide substrate according to the claim 1, wherein the material with a low index of refraction is air.

14. A method of propagating an optical signal within a waveguide comprising:

providing an optical signal at an input port;

propagating said optical signal within a weakly confining portion of the waveguide;

propagating said optical signal within a transition region of the waveguide, said transition region of the waveguide supporting a near adiabatic optical mode transition; and,

propagating said optical signal within a strongly confining region of the waveguide.

15. A method of propagating an optical signal according to claim 14, comprising:

propagating said optical signal within a second transition region of the waveguide, said second transition region of the waveguide supporting a near adiabatic optical mode transition; and,

propagating said optical signal within a second weakly confining portion of the waveguide.

16. A method of propagating an optical signal according to claim 14, wherein the transition region comprises:

a first portion of a first trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein;

a second trench portion of the first trench disposed sufficiently proximate said waveguide to substantially enhance confinement of an optical signal propagating within the waveguide.

17. A method of propagating an optical signal according to claim 16, comprising: providing a second waveguide proximate the first waveguide such that the second trench portion is optically disposed between the first and second waveguides wherein said first and second waveguides are disposed on a same waveguide structure.

18. A storage medium for storing instructions for, when executed, resulting in a design for a waveguide structure, the waveguide structure comprising:

a waveguide comprising;

a curved waveguide portion that is curved having local radii of curvature, and

a first trench disposed on an inside of the curvature of the waveguide, said first trench having a low index of refraction material disposed therein, said first trench comprising;

a first portion of the first trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein,

a second trench portion of the first trench disposed sufficiently proximate said waveguide to substantially enhance confinement of an optical signal propagating within the curved waveguide portion, and

a third trench portion of the first trench disposed sufficiently distant the waveguide to prevent a change in mode profile of an optical signal propagating therein.

19. A storage medium according to claim 18, wherein the design of the waveguide structure comprises:

a second waveguide disposed opposite the trench from the first waveguide.

20. A storage medium according to claim 19, wherein the second waveguide is disposed sufficiently proximate said second waveguide to substantially enhance confinement of an optical signal propagating within the second waveguide.